

JP6112261 AUTOMATIC WIRE BONDER

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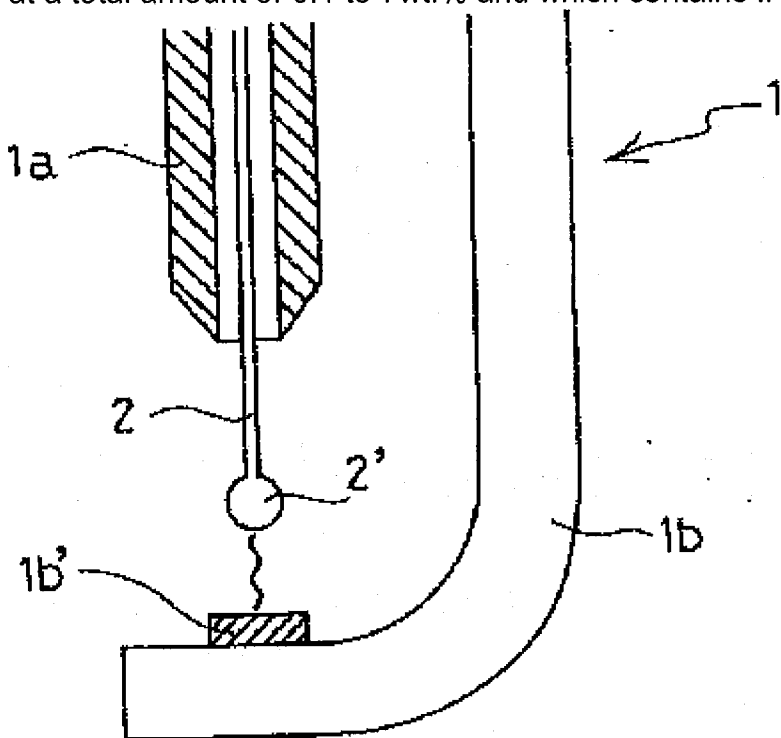
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Abstract

PURPOSE: To provide an automatic wire bonder by which an irregularity in a ball diameter is small when a ball is formed by making an electric discharge from a discharging electrode more stable.

CONSTITUTION: A discharging electrode 1a and its head part 1b are formed of an Ir alloy which contains one kind or two or more kinds out of Os, Ru, Pt, Rh and Pd at a total amount of 1 to 30wt.%, which contains one kind or two or more kinds out of Re, W and Mo at a total amount of 0.1 to 7wt.% and which contains Ir as the remainder.



[Claim(s)]

[Claim 1] the discharge electrode for ball formation at the time of bonding -- one or more of Os, Ru, Pt, Rh, and Pd - total amount 1 - 30wt% - remainder Ir and the automatic wire characterized by this alloy.

[Claim 2] the discharge electrode for ball formation at the time of bonding -- one or more of Os, Ru, Pt, Rh, and Pd - total amount 1 - 30wt% - while also containing -- one or more of Re, W, and Mo - total amount 0.1 - 7wt% - remainder Ir, and the automatic wire bonder characterized by using this Ir alloy.

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the discharge electrode for ball formation in said wire bonder in more detail about the automatic wire bonder used in order to connect the chip electrode of a semiconductor device, and an external lead.

[0002]

[Description of the Prior Art] As shown in drawing 1 from the former, carry out melting of the head of the Au line 2 which made it hang at the head of capillary tube 1a by discharge from head head section 1b' of discharge electrode 1b, and ball 2' is formed. The bump continuation which sticks by pressure and cuts this ball 2' at the electrode which consists of aluminum or aluminum alloy on a chip, and forms a bump electrode, After sticking said ball 2' to a chip electrode by pressure and making it join, it leads to an external lead in the shape of a loop formation, and the wirebonding method for connecting a chip electrode and an external lead to this external lead by sticking by pressure and cutting is learned.

[0003] Moreover, what added a small amount of impurity to refractory metals, such as W-Y and W-La, as a useful automatic wire bonder 1, and formed discharge electrode 1b for using for this bonding method is known (JP,1-256134,A).

[0004]

[Problem(s) to be Solved by the Invention]

However, in the wire bonder of the above-mentioned method, W-Y and W-La tended to oxidize, and since an oxide skin is formed in a discharge electrode front face, as a result of discharge becoming unstable and dispersion's arising in the diameter of a ball formed, there was nonconformity to which the connection resilience after bonding becomes low.

[0005] This invention is made in view of a situation such conventionally, and the place made into the object is to reduce dispersion in the diameter of the ball [discharge / from a discharge electrode] at the time of ball formation as a more stable thing.

[0006]

[Means for Solving the Problem] the discharge electrode for the bonder of this invention formation at the time of bonding in order to attain the above object -- one sort out of Os, Ru, Pt, Rh, and Pd, or two sorts or more -- total amount 1 - 30wt% -- it contains and is characterized by being Ir alloy which consists of the remainder Ir.

[0007] moreover, the below-mentioned reason to said discharge electrode -- one sort out of Os, Ru, Pt, Rh, and Pd, or two sorts or more -- total amount 1 - 30wt% -- while containing -- one sort out of Re, W, and Mo, or two sorts or more -- total amount 0.1 - 7wt% -- it is good that it is also Ir alloy which contains and consists of the remainder Ir.

[0008]

[Function] According to the above-mentioned configuration, since it evaporates at about 400 degrees C even if it oxidizes, an oxide film is not formed in the discharge electrode front face which becomes an elevated temperature (about 3000 degrees C) at the time of discharge, but Ir alloy which comes to add Os, Ru, Pt, Rh, and Pd, and Ir alloy which comes to add Re, W, and Mo in addition to the aforementioned combination become that by which the discharge from this electrode was stabilized. therefore, dispersion of the diameter of a ball -- very -- small -- it considers as a range thing and the connection resilience after bonding can be improved.

[0009] Moreover, since the discharge electrode became an elevated temperature at the time of discharge, it chose what is high-melting to the alloying element which forms Ir alloy, i.e., Os, Ru, Pt, Rh, and Pd. Furthermore, improvement in the workability at the time of electrode production could be aimed at by carrying out simultaneous adding of at least one sort out of Re, W, and Mo.

[0010] However, since a segregation will arise and Ir alloy will become uneven if high temperature strength and the addition total amount of Os, Ru, Pt, Rh, and Pd satisfactory less than [1wt%] is not obtained and the addition total amount of Os, Ru, Pt, Rh, and Pd exceeds 30wt(s)%, it is not desirable.

[0011] Furthermore, if the above-mentioned effectiveness cannot be acquired if the addition total amount of Re, W, and Mo is less than [0.1wt%], and the addition total amount of these alloying elements exceeds 7wt(s)%, since Ir alloy will become uneven, it is not desirable.

[0012] Therefore, the total addition of Os, Ru, Pt, Rh, and Pd was set as the range of 1 - 30wt%, and the total addition of Re, W, and Mo was respectively set as the range of 0.1 - 7wt%.

[0013]

[Example] Hereafter, a concrete example and the example of a comparison are explained. Os, Ru, Pt, Rh, Pd, Re, W, and Mo were added based on the content shown in a table 1, dissolution casting was carried out, and it considered as each sample at Ir of 99.9% or more of purity.

[0014] Sample No.1-10 in a table 1 Os, Ru, Pt, Rh, Pd this invention operation article which added one sort out of (calling it an alloying element I hereafter), They are this invention operation article which added one sort out of Re, W, and Mo (henceforth an alloying element II) in addition to combination of the above [sample NO.11-16], and this invention operation article which sample No.17-22 chose two or more sorts, and added out of said alloying element I.

[0015] Moreover, sample No.23 in a table 1 are a comparison article it is unrefined from a W-Y alloy.

[0016] The automatic wire bonder 1 was constituted for discharge electrode 1b as shown in drawing 1 , and its head section 1b' with shaping **** using each sample produced as mentioned above. Then, the discharge current was adjusted so that it might fix to 4ms of charging time values and might become 62.5 micrometers of diameters of a ball using Au wire (phi25micrometer) generally used, and the average and standard deviation of the diameter of a ball at the time of producing ten balls after 50,000 times discharge were measured respectively. These results are also shown in a table 1.

[0017]

[Table 1]

A=Example/Alloy No B=Alloy addition (Rest is Ir) C=ball diameter

A

B

C

No	I r	添加元素 (wt%)								ボール径 (μ m)	
		O s	R u	P t	R h	P d	R e	W	M o	平均値	標準偏差
実	1 残り	1								62.65	0.624
	2 ↑	3 0								62.59	0.611
	3 ↑		1							62.73	0.782
	4 ↑		3 0							62.66	0.721
	5 ↑			1						62.49	0.651
	6 ↑			3 0						62.53	0.712
	7 ↑				1					62.61	0.810
	8 ↑				3 0					62.58	0.773
	9 ↑					1				62.67	0.785
	10 ↑					3 0				62.71	0.803
施	11 ↑	1 0					0.1			62.59	0.620
	12 ↑	1 0					7			62.51	0.609
	13 ↑		1 0					0.1		62.53	0.612
	14 ↑		1 0					7		62.60	0.603
	15 ↑			1 0					0.1	62.71	0.731
	16 ↑			1 0					7	62.69	0.689
	17 ↑		1 5	1 5						62.56	0.633
	18 ↑			2 0		1 0				62.48	0.610
	19 ↑	1 0				2 0				62.44	0.652
	20 ↑		1 0	1 0		1 0				62.61	0.601
品	21 ↑	5	5	5		5				62.50	0.644
	22 ↑	5	5	5	5	5				62.53	0.635
*	23									62.83	1.163

* : 比較品

[0018] if it **, and an alloying element I (Os, Ru, Pt, Rh, Pd) is added to Ir of 99.9% or more of purity by total addition 1 - 30wt% of within the limits and an alloying element II (Re,

W, Mo) is further added from the measurement result of sample No.1-22 by total addition 0.1 - 7wt% of within the limits -- dispersion in the diameter of a ball -- very -- small -- it has checked that it could consider as a range thing.

[0019] Moreover, when the discharge electrode which consists of a W-Y alloy was used from the measurement result of sample No.23, as compared with the above-mentioned this invention operation article, it has checked that dispersion in the diameter of a ball was very large.

[0020] In addition, although both were really fabricated by each above-mentioned sample in this example by using discharge electrode 1b and head section 1b' as a moldings, it is also possible only for head section 1b' to fabricate them by each above-mentioned sample, using these both as another ****, and it cannot be overemphasized that the same measurement result as **** and effectiveness are acquired also in this case.

[0021]

[Effect of the Invention] dispersion in the diameter of the ball [the automatic wire bonder concerning this invention is using the discharge electrode which consists of an Ir alloy which carried out specified quantity addition of Os, Ru, Pt, Rh, Pd, Re, W, and the Mo, as explained above and] at the time of ball shaping -- very -- small -- it could consider as the range thing.

[0022] Therefore, the ball after bonding and the bonding strength of a chip electrode have been improved remarkably, and the very useful automatic wire bonder has been offered for using for the wirebonding method and bump continuation.